

EXERCISE 1-1

Multiple Choice Questions (MCQs)

Q.1 Four options are given in each of the following questions, the choice which you think is correct; fill the circle in front of that choice. Use marker or pen to fill the circles. Cutting or filling two or more circles is not allowed:

(i) Which of the following is a proposition?

- (a) What is your age? (b) Always work hard.
(c) Do not irritate him (d) Quetta is a city of Pakistan

(a) (b) (c) (d)

Sol: (a), (b) and (c) are not propositions, because these are neither true nor false.

(d) is a proposition and its truth value is true (T).

Correct answer is option (d).

(a) (b) (c) (d)

(ii) Which of the following is not a proposition?

- (a) $7 > 9$ (b) $2 + 3 = 5$ (c) $x < 5$ (d) $2 + 3 \neq 5$

(a) (b) (c) (d)

Sol: (c) is not a proposition, because it is neither true nor false.

Correct answer is option (c).

(a) (b) (c) (d)

(iii) Which of the following is a proposition?

- (a) Do not smoke (b) $x + y = z$
(c) Lahore is capital of Punjab (d) Walk along the road

(a) (b) (c) (d)

Sol: (c) is a proposition and its truth value is true (T).

Correct answer is option (c).

(a) (b) (c) (d)

(iv) The negation of "Today is Friday" is

- (a) Today is Saturday (b) Today is not Friday
(c) Today is Thursday (d) None of these

(a) (b) (c) (d)

Sol: The negation of "Today is Friday" is "Today is not Friday".
Correct answer is option (b).

(v) If $p : x + y = 3$, then $\neg p$ is

- (a) $x + y \neq 3$ (b) $x + y > 3$ (c) $x + y < 3$ (d) $x + y = 0$

Sol: The negation of " $x + y = 3$ " is " $x + y \neq 3$ ".

Correct answer is option (a).

(vi) An arrangement of rows and columns that specifies the truth value of a compound proposition for all possible truth values of its constituent propositions is called

- (a) Truth Table (b) Venn diagram
(c) False Table (d) None of these

Sol: Correct answer is option (a).

(vii) Contrapositive of given statement "If it is raining, I will take an umbrella" is

- (a) I will not take an umbrella if it is not raining
(b) I will take an umbrella if it is raining
(c) It is not raining or I will take an umbrella
(d) None of these

Sol: Correct answer is option (a).

(viii) $p \wedge q$ is true if

- (a) p is false (b) q is false
(c) both p and q are false (d) both p and q are true

Sol: $p \wedge q$ is true if both p and q are true.

Correct answer is option (d).

(ix) $p \vee q$ is false if

- (a) p is false (b) q is false
(c) both p and q are false (d) both p and q are true

Sol: $p \vee q$ is false if both p and q are false.

Correct answer is option (c).

(x) $p \oplus q$ is true if

- (a) p is false (b) q is false and p is true
(c) both p and q are false (d) both p and q are true

Sol: $p \oplus q$ is the proposition that is true when exactly one of p and q is true and is false otherwise.

Correct answer is option (b).

(xi) If $p : 2^2 > 1^2$; $q : \text{every odd number is divisible by 2}$, then

- (a) $p \vee q$ is false (b) $p \vee q$ is true
(c) $p \wedge q$ is true (d) $p \oplus q$ is false

Sol: Here p is true and q is false, so $p \vee q$ is true.

- (xii) Correct answer is option (b).
 If $p : 2 + 3 = 5$; $q : \text{every even number is divisible by 2}$, then
 (a) $p \vee q$ is false (b) $p \wedge q$ is false
 (c) $p \wedge q$ is true (d) $p \oplus q$ is true

Sol: Here both p and q are true, so $p \wedge q$ is true.
 Correct answer is option (c).

- (xiii) If $p : \text{Islamabad is a capital of Pakistan}$;
 $q : \text{No even integer is divisible by 2}$, then which of the
 following is true?
 (a) $p \wedge q$ (b) $p \oplus q$ (c) $p \oplus \neg q$ (d) $\neg p \vee q$

Sol: Here p is true and q is false.
 Correct answer is option (b).

- (xiv) If $p : \text{no lion eats meat}$; $q : 1 + 1 = 2$, then
 (a) $p \rightarrow q$ is false (b) $p \rightarrow q$ is true
 (c) $p \oplus \neg q$ is true (d) $\neg p \wedge q$ false

Sol: Here p is false and q is true.
 Correct answer is option (b).

- (xv) The converse of $p \rightarrow q$ is
 (a) $q \rightarrow p$ (b) $\neg p \rightarrow \neg q$
 (c) $\neg q \rightarrow \neg p$ (d) $p \leftrightarrow q$

Sol: Correct answer is option (a).

- (xvi) The inverse of $p \rightarrow q$ is
 (a) $q \rightarrow p$ (b) $\neg p \rightarrow \neg q$
 (c) $\neg q \rightarrow \neg p$ (d) $p \leftrightarrow q$

Sol: Correct answer is option (b).

- (xvii) The contrapositive of $p \rightarrow q$ is
 (a) $q \rightarrow p$ (b) $\neg p \rightarrow \neg q$
 (c) $\neg q \rightarrow \neg p$ (d) $p \leftrightarrow q$

Sol: Correct answer is option (c).

EXERCISE 1-2

Multiple Choice Questions (MCQs)

Q.1

Four options are given in each of the following questions, the choice which you think is correct; fill the circle in front of that choice. Use marker or pen to fill the circles. Cutting or filling two or more circles is not allowed:

(i)

$$10 \wedge 11 =$$

(a) 01

(b) 10

(c) 11

(d) 00

Sol:

$$\begin{array}{r} \wedge 11 \\ \hline 10 \end{array}$$

(a)

(b)

(c)

(d)

Correct answer is option (b).

(a)

(b)

(c)

(d)

(ii)

$$10 \vee 11 =$$

(a) 01

(b) 10

(c) 11

(d) 00

(a)

(b)

(c)

(d)

Sol:

$$\begin{array}{r} 10 \\ v \\ 11 \\ \hline 11 \end{array}$$

Correct answer is option (c).

- (iii) $10 \oplus 11 =$
 (a) 01 (b) 10 (c) 11 (d) 00

Sol:

$$\begin{array}{r} 10 \\ \oplus \\ 11 \\ \hline 01 \end{array}$$

Correct answer is option (a).

- (iv) $1011 \wedge 0110 =$
 (a) 0010 (b) 1111 (c) 1101 (d) 1001

Sol:

$$\begin{array}{r} 1011 \\ \wedge \\ 0110 \\ \hline 0010 \end{array}$$

Correct answer is option (a).

- (v) $1011 \vee 0110 =$
 (a) 0010 (b) 1111 (c) 1101 (d) 1001

Sol:

$$\begin{array}{r} 1011 \\ v \\ 0110 \\ \hline 1111 \end{array}$$

Correct answer is option (b).

- (vi) $1011 \oplus 0110 =$
 (a) 0010 (b) 1111 (c) 1101 (d) 1001

Sol:

$$\begin{array}{r} 1011 \\ \oplus \\ 0110 \\ \hline 1101 \end{array}$$

Correct answer is option (c).

- (vii) Let us consider propositions

p : He works hard

q : He gets first position

Then translation of $p \wedge \neg q$ is:

- (a) If he works hard, then he gets first position.
 (b) If he gets first position, then he works hard.
 (c) He works hard but he does not get first position.
 (d) He gets first position but does not work hard.

Sol: $p \wedge \neg q$: He works hard but he does not get first position.

(viii) Correct answer is option (c).

Let

p : He completes BS in 5 years.

q : He gets job.

Then $q \rightarrow p$:

- (a) If he completes BS in 5 years, then he gets job.
 (b) If he gets job, then he completes BS in 5 years.
 (c) He completes BS in 5 years and he gets job.

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(a) (b) (c) (d)

(d) He gets job and he completes BS in 5 years.

Sol: $q \rightarrow p$: If he gets job, then he completes BS in 5 years.
Correct answer is option (b).

(a) (b) (c) (d)
(a) (b) (c) (d)

(ix) NOT gate has
(a) four inputs
(b) three inputs
(c) two inputs
(d) one input

(a) (b) (c) (d)
(a) (b) (c) (d)

Sol: NOT gate has one input.
Correct answer is option (d).

(x) OR gate has
(a) four inputs
(b) three inputs
(c) two inputs
(d) one input

(a) (b) (c) (d)
(a) (b) (c) (d)

Sol: OR gate has two inputs.
Correct answer is option (c).

(xi) AND gate has
(a) four inputs
(b) three inputs
(c) two inputs
(d) one input

(a) (b) (c) (d)
(a) (b) (c) (d)

Sol: AND gate has two inputs.
Correct answer is option (c).

(xii) NOT gate has
(a) four outputs
(b) three outputs
(c) two outputs
(d) one output

(a) (b) (c) (d)
(a) (b) (c) (d)

Sol: NOT gate has one output.
Correct answer is option (d).

(xiii) OR gate has
(a) four outputs
(b) three outputs
(c) two outputs
(d) one output

(a) (b) (c) (d)
(a) (b) (c) (d)

Sol: OR gate has two outputs.
Correct answer is option (c).

(xiv) AND gate has
(a) four outputs
(b) three outputs
(c) two outputs
(d) one output

(a) (b) (c) (d)
(a) (b) (c) (d)

Sol: AND gate has two outputs.
Correct answer is option (c).

Short Questions

Answers of the following short questions

EXERCISE 1-3

Multiple Choice Questions (MCQs)

Q.1 Four options are given in each of the following questions, the choice which you think is correct; fill the circle in front of that choice. Use marker or pen to fill the circles. Cutting or filling two or more circles is not allowed:

(i) $p \wedge T \equiv$

(a) p

(b) $\neg p$

(c) T

(d) F

☒ (a)

☐ (b)

☐ (c)

☐ (d)

Sol: Identity law states that $p \wedge T \equiv p$
Correct answer is option (a).

(ii) $p \vee F \equiv$

(a) p

(b) $\neg p$

(c) T

(d) F

☒ (a)

☐ (b)

☐ (c)

☐ (d)

Sol: Identity law states that $p \vee F \equiv p$
Correct answer is option (a).

(iii) $p \vee T \equiv$

(a) p

(b) $\neg p$

(c) T

(d) F

☐ (a)

☐ (b)

☐ (c)

☐ (d)

Sol: Domination law states that $p \vee T \equiv T$
Correct answer is option (c).

(iv) $p \wedge F \equiv$

(a) p

(b) $\neg p$

(c) T

(d) F

☐ (a)

☐ (b)

☐ (c)

☒ (d)

Sol: Domination law states that $p \wedge F \equiv F$
Correct answer is option (d).

☐ (a)

☐ (b)

☐ (c)

☒ (d)

(v) $p \wedge p \equiv$
(a) p

(b) $\neg p$

(c) T

(d) F

(a) (b) (c) (d)

Sol: Idempotent law states that $p \wedge p \equiv p$
Correct answer is option (a).

(a) (b) (c) (d)

(vi) $p \vee p \equiv$
(a) p

(b) $\neg p$

(c) T

(d) F

(a) (b) (c) (d)

Sol: Idempotent law states that $p \vee p \equiv p$
Correct answer is option (a).

(a) (b) (c) (d)

(vii) $\neg(\neg p) \equiv$
(a) F

(b) T

(c) $\neg p$

(d) p

(a) (b) (c) (d)

Sol: Double negation law states that $\neg(\neg p) \equiv p$
Correct answer is option (d).

(a) (b) (c) (d)

(viii) $p \vee q \equiv$

(a) $p \wedge q$

(b) $q \wedge p$

(c) $q \vee p$

(d) none of these

(a) (b) (c) (d)

Sol: Commutative law states that $p \vee q \equiv q \vee p$
Correct answer is option (c).

(a) (b) (c) (d)

(ix) $p \wedge q \equiv$

(a) $p \vee q$

(b) $q \wedge p$

(c) $q \vee p$

(d) none of these

(a) (b) (c) (d)

Sol: Commutative law states that $p \wedge q \equiv q \wedge p$
Correct answer is option (b).

(a) (b) (c) (d)

(x) $p \vee \neg p \equiv$

(a) p

(b) $\neg p$

(c) T

(d) F

(a) (b) (c) (d)

Sol: Correct answer is option (c).

(a) (b) (c) (d)

(xi) $p \wedge \neg p \equiv$

(a) p

(b) $\neg p$

(c) T

(d) F

(a) (b) (c) (d)

Sol: Correct answer is option (d).

(a) (b) (c) (d)

(xii) $\neg(p \wedge q) \equiv$

(a) $p \vee q$

(b) $\neg p \vee \neg q$

(c) $p \wedge q$

(d) $\neg p \wedge \neg q$

(a) (b) (c) (d)

Sol: De Morgan's law states that $\neg(p \wedge q) \equiv \neg p \vee \neg q$
Correct answer is option (b).

(a) (b) (c) (d)

(xiii) $\neg(p \vee q) \equiv$

(a) $p \vee q$

(b) $\neg p \vee \neg q$

(c) $p \wedge q$

(d) $\neg p \wedge \neg q$

(a) (b) (c) (d)

Sol: De Morgan's law states that $\neg(p \vee q) \equiv \neg p \wedge \neg q$
Correct answer is option (d).

(a) (b) (c) (d)

(xiv) $p \vee (p \wedge q) =$

(a) p

(b) q

(c) $p \wedge q$

(d) $p \vee q$

(a)

(b)

(c)

(d)

Sol: Absorption law states that $p \vee (p \wedge q) = p$
Correct answer is option (a).

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(xv) $p \wedge (p \vee q) =$

(a) p

(b) q

(c) $p \wedge q$

(d) $p \vee q$

(a)

(b)

(c)

(d)

Sol: Absorption law states that $p \wedge (p \vee q) = p$
Correct answer is option (a).

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(xvi) $p \wedge T = p$ is

(a) double negation law

(b) idempotent law

(c) domination law

(d) identity law

(a)

(b)

(c)

(d)

Sol: Identity law states that $p \wedge T = p$
Correct answer is option (d).

(a)

(b)

(c)

☒

(xvii) $p \vee T = T$ is

(a) double negation law

(b) idempotent law

(c) domination law

(d) identity law

(a)

(b)

(c)

(d)

Sol: Domination law states that $p \vee T = T$
Correct answer is option (c).

(a)

(b)

☒

(d)

(xviii) $p \wedge F = F$ is

(a) double negation law

(b) idempotent law

(c) domination law

(d) identity law

(a)

(b)

(c)

(d)

Sol: Domination law states that $p \wedge F = F$
Correct answer is option (c).

(a)

(b)

☒

(d)

(xix) $p \vee p = p$ is

(a) double negation law

(b) idempotent law

(c) domination law

(d) identity law

(a)

(b)

(c)

(d)

Sol: Idempotent law states that $p \vee p = p$
Correct answer is option (b).

(a)

☒

(c)

(d)

(xx) $p \wedge p = p$ is

(a) double negation law

(b) idempotent law

(c) domination law

(d) identity law

(a)

(b)

(c)

(d)

Sol: Idempotent law states that $p \wedge p = p$
Correct answer is option (b).

(a)

☒

(c)

(d)

(xxi) $\neg(\neg p) = p$ is

(a) double negation law

(b) idempotent law

(c) domination law

(d) identity law

(a)

(b)

(c)

(d)

Sol: Double negation law states that $\neg(\neg p) \equiv p$
Correct answer is option (a).

☒ (a) ☐ (b) ☐ (c) ☐ (d)

(xxii) $p \vee \neg p \equiv T$ is

- (a) double negation law
(c) domination law

- (b) idempotent law
(d) negation law

☐ (a) ☐ (b) ☐ (c) ☐ (d)

Sol: Negation law states that $p \vee \neg p \equiv T$
Correct answer is option (d).

☐ (a) ☐ (b) ☐ (c) ☒ (d)

(xxiii) $p \wedge \neg p \equiv F$ is

- (a) double negation law
(c) negation law

- (b) idempotent law
(d) domination law

☐ (a) ☐ (b) ☐ (c) ☐ (d)

Sol: Negation law states that $p \wedge \neg p \equiv F$
Correct answer is option (c).

☐ (a) ☐ (b) ☒ (c) ☐ (d)

EXERCISE 1-4

Multiple Choice Questions (MCQs)

Q.1 Four options are given in each of the following questions, the choice which you think is correct; fill the circle in front of that choice. Use marker or pen to fill the circles. Cutting or filling two or more circles is not allowed:

- (i) In the statement "x is greater than 8"
- (a) x is predicate (b) "is greater than 8" is subject
(c) x is subject (d) none of these

(a) (b) (c) (d)

Sol: In the statement "x is greater than 8", x is subject.
Correct answer is option (c).

(a) (b) (c) (d)

- (ii) In the statement "Zeeshan is a handsome man" predicate is
- (a) is a handsome man (b) Zeeshan
(c) man (d) handsom

(a) (b) (c) (d)

Sol: In the statement "Zeeshan is a handsome man", predicate is "is a handsome man"

Correct answer is option (a).

(a) (b) (c) (d)

- (iii) If $P(x) : x + 1 = 7$, then

(a) $P(2) : 7 = 7$ (b) $P(2) : 3 = 7$
(c) $P(3) : 3 = 7$ (d) $P(4) : 4 = 7$

(a) (b) (c) (d)

Sol: Correct answer is option (b).

(a) (b) (c) (d)

- (iv) If $P(x) : x + 1 = 7$, then which is true?

(a) $P(2)$ (b) $P(3)$ (c) $P(4)$ (d) $P(6)$

(a) (b) (c) (d)

Sol: Correct answer is option (d).

(a) (b) (c) (d)

- (v) If $P(x) : x^2 + 1 < 5$, then which is true?

(a) $P(1)$ (b) $P(2)$ (c) $P(3)$ (d) $P(4)$

(a) (b) (c) (d)

Sol: Correct answer is option (a).

(a) (b) (c) (d)

- (vi) If $Q(x, y) : y = x^2 + 2$, then which is true?

(a) $Q(0, 0)$ (b) $Q(2, 6)$ (c) $Q(6, 2)$ (d) $Q(1, 1)$

(a) (b) (c) (d)

Sol: Correct answer is option (b).

(a) (b) (c) (d)

- (vii) $P(x)$: The word x contains the letter a. Which is true?

(a) $P(\text{book})$ (b) $P(\text{school})$ (c) $P(\text{orange})$ (d) $P(\text{college})$

(a) (b) (c) (d)

Sol: Correct answer is option (c).

(viii) If $P(x) : x < 1$ and the domain of discourse is real numbers which is true?
 (a) $\forall x P(x)$ (b) $\exists x P(x)$ (c) $\exists! x P(x)$ (d) none of these

Sol: Since $x < 1$ is true for some x .
 Correct answer is option (b).

(ix) If $P(x) : |x| = 0$ and the domain is real numbers, which is true?
 (a) $\forall x P(x)$ (b) $\neg \exists x P(x)$ (c) $\exists! x P(x)$ (d) $\neg \forall x P(x)$

Sol: Since $|x| = 0$ is true only for $x = 0$.
 Correct answer is option (c).

(x) If the domain of discourse consists of elements x_1, x_2, x_3 , then
 (a) $\forall x P(x) \equiv P(x_1) \wedge P(x_2) \wedge P(x_3)$
 (b) $\exists x P(x) \equiv P(x_1) \wedge P(x_2) \wedge P(x_3)$
 (c) $\exists! x P(x) \equiv P(x_1) \wedge P(x_2) \wedge P(x_3)$
 (d) $\exists! x P(x) \equiv P(x_1) \vee P(x_2) \vee P(x_3)$

Sol: Correct answer is option (a).

(xi) If the domain of discourse consists of elements x_1, x_2, x_3 , then
 (a) $\forall x P(x) \equiv P(x_1) \vee P(x_2) \vee P(x_3)$
 (b) $\exists x P(x) \equiv P(x_1) \vee P(x_2) \vee P(x_3)$
 (c) $\exists! x P(x) \equiv P(x_1) \wedge P(x_2) \wedge P(x_3)$
 (d) $\exists! x P(x) \equiv P(x_1) \vee P(x_2) \vee P(x_3)$

Sol: Correct answer is option (b).

(xii) $\neg \exists x P(x)$
 (a) $\forall x \neg P(x)$ (b) $\exists x \neg P(x)$ (c) $\exists x P(x)$ (d) $\forall x P(x)$

Sol: Correct answer is option (a).

(xiii) $\neg \forall x P(x)$
 (a) $\forall x \neg P(x)$ (b) $\exists x \neg P(x)$ (c) $\exists x P(x)$ (d) $\forall x P(x)$

Sol: Correct answer is option (b).

(xiv) If $P(x) : x > 5$, then $\neg \forall x P(x)$
 (a) $\forall x (x \leq 5)$ (b) $\forall x (x < 5)$ (c) $\exists x (x < 5)$ (d) $\exists x (x \leq 5)$

Sol: Correct answer is option (d).

(xv) If $P(x) : x > 5$, then $\neg \exists x P(x)$
 (a) $\forall x (x \leq 5)$ (b) $\forall x (x < 5)$ (c) $\exists x (x < 5)$ (d) $\exists x (x \leq 5)$

Sol: $\neg \exists x P(x) = \forall x \neg P(x)$
 $= \forall x (x \leq 5)$
 Correct answer is option (a).

EXERCISE 1-5

Multiple Choice Questions (MCQs)

Q.1 Four options are given in each of the following questions, the choice which you think is correct; fill the circle in front of that choice. Use marker or pen to fill the circles. Cutting or filling two or more circles is not allowed:

(i) $\neg \forall x \exists y (xy = 2) \equiv$

(a) $\forall x \forall y (xy \neq 2)$

(b) $\exists x \forall y (xy = 2)$

(c) $\exists x \exists y (xy \neq 2)$

(d) $\forall x \exists y (xy = 2)$

(a) (b) (c) (d)

Sol: $\neg \forall x \exists y (xy = 2) \equiv \exists x \neg \exists y (xy = 2)$

$\equiv \exists x \forall y \neg (xy = 2)$

$\equiv \exists x \forall y (xy \neq 2)$

Correct answer is option (a).

(ii) $\neg \exists x \forall y (xy = 2) \equiv$

(a) $\exists x \forall y (xy \neq 2)$

(b) $\exists x \forall y (xy = 2)$

(c) $\forall x \exists y (xy \neq 2)$

(d) $\forall x \exists y (xy = 2)$

(a) (b) (c) (d)

Sol: $\neg \exists x \forall y (xy = 2) \equiv \forall x \neg \forall y (xy = 2)$

$\equiv \forall x \exists y \neg (xy = 2)$

$\equiv \forall x \exists y (xy \neq 2)$

Correct answer is option (c).

(iii) Translate $\forall x \exists y (x < y)$ into English, where the domain for each variable consists of all real numbers is

(a) There is some real number which is less than every real number.

(b) Every real number is less than some real number.

(c) No real number is less than some real number.

(d) No real number is greater than some real number.

Sol: Every real number is less than some real number.

Correct answer is option (b).

(iv) Translate $\exists x \forall y (x < y)$ into English, where the domain for each variable consists of all real numbers is

(a) There is some real number which is less than every real number.

(b) Every real number is less than some real number.

(c) No real number is less than some real number.

(d) No real number is greater than some real number.

(a) (b) (c) (d)

Sol: There is some real number which is less than every real number. Correct answer is option (a). (b) (c) (d)

(v) Let $Q(x, y)$: x has sent an e-mail message to y . Where the domain for both x and y consists of all students in your class. The English of quantification $\exists x \exists y Q(x, y)$ is

(a) Every student in your class has sent an e-mail message to some student in your class.

(b) Some student in your class has sent an e-mail message to every student in your class.

(c) Every student in your class has sent an e-mail message to every student in your class.

(d) Some student in your class has sent an e-mail message to some student in your class.

(a) (b) (c) (d)

Sol: Some student in your class has sent an e-mail message to some student in your class.

Correct answer is option (d).

(a) (b) (c) (d)

(vi) Let $Q(x, y)$: x has sent an e-mail message to y . Where the domain for both x and y consists of all students in your class. The English of quantification $\forall x \exists y Q(x, y)$ is

(a) Every student in your class has sent an e-mail message to some student in your class.

(b) Some student in your class has sent an e-mail message to every student in your class.

(c) Every student in your class has sent an e-mail message to every student in your class.

(d) Some student in your class has sent an e-mail message to some student in your class.

(a) (b) (c) (d)

Sol: Every student in your class has sent an e-mail message to some student in your class.

Correct answer is option (a).

(a) (b) (c) (d)

(vii) Let $Q(x, y)$: x has sent an e-mail message to y . Where the domain for both x and y consists of all students in your class. The English of quantification $\exists x \forall y Q(x, y)$ is

(a) Every student in your class has sent an e-mail message to some student in your class.

(b) Some student in your class has sent an e-mail message to every student in your class.

(c) Every student in your class has sent an e-mail message to every student in your class.

(d) Some student in your class has sent an e-mail message to some student in your class.

(a) (b) (c) (d)

Sol: Some student in your class has sent an e-mail message to every student in your class.

Correct answer is option (b).

(a) ☐ (b) ☒ (c) ☐ (d) ☐

(viii) Let $Q(x, y) : x$ has sent an e-mail message to y .
Where the domain for both x and y consists of all students in your class. The English of quantification $\forall x \forall y Q(x, y)$ is

(a) Every student in your class has sent an e-mail message to some student in your class.

(b) Some student in your class has sent an e-mail message to every student in your class.

(c) Every student in your class has sent an e-mail message to every student in your class.

(d) Some student in your class has sent an e-mail message to some student in your class.

(a) ☐ (b) ☒ (c) ☐ (d) ☐

Sol: Every student in your class has sent an e-mail message to every student in your class.

Correct answer is option (c).

(a) ☐ (b) ☐ (c) ☒ (d) ☐

(ix) Let $L(x, y) : x$ loves y .
Where the domain for both x and y consists of all people in the world.

Using quantifiers, the statement "Everybody loves somebody" becomes

(a) $\exists x \forall y L(x, y)$

(b) $\forall x \exists y L(x, y)$

(c) $\exists x \exists y L(x, y)$

(d) $\forall x \forall y L(x, y)$

(a) ☐ (b) ☒ (c) ☐ (d) ☐

Sol: $\forall x \exists y L(x, y) : \text{Everybody loves somebody}$

Correct answer is option (b).

(a) ☐ (b) ☒ (c) ☐ (d) ☐

(x) Let $L(x, y) : x$ loves y .
Where the domain for both x and y consists of all people in the world.

Using quantifiers, the statement "Somebody loves everybody" becomes

(a) $\exists x \forall y L(x, y)$

(b) $\forall x \exists y L(x, y)$

(c) $\exists x \exists y L(x, y)$

(d) $\forall x \forall y L(x, y)$

(a) ☐ (b) ☒ (c) ☐ (d) ☐

Sol: $\exists x \forall y L(x, y) : \text{Somebody loves everybody}$

Correct answer is option (a).

(a) ☒ (b) ☐ (c) ☐ (d) ☐